REMARKS

The Office Action mailed March 12, 2004, has been carefully reviewed and, in view of the following remarks, Applicants respectfully request reconsideration and allowance of claims 1-5 which are pending.

The Examiner rejected claims 1 and 2 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,215,584 to Yang et al. ("Yang") in view of U.S. Patent No. 5,986,782 to Alexander et al. ("Alexander"), and rejected claims 3-5 under 35 U.S.C. 103(a) as being unpatentable over Yang and Alexander in view of U.S. Patent No. 6,009,220 to Chan et al. ("Chan").

Yang relates to an input independent tilt free activity gain flattened broadband amplifier, and teaches a method for flattening the gain profile of an Erbium doped fiber-based amplifier (EDFA) which is used in a wavelength division multiplexing (WDM) optical transmission system. By contrast, the present invention relates to an optical performance monitoring apparatus for a WDM optical communication system which measures an optical signal-to-noise ratio for each channel by measuring power and ASE noise for each channel of a WDM signal. Clearly, the subject matter of the present invention is entirely different from that of Yang.

More particularly, the EDFA has a different gain profile according to the overall input power. So, if the gain profile is broken and gain tilt is generated over the wavelength area in which the gain profile is broken, the extent of amplification for each channel is different. When the WDM signal goes through a plurality of amplifiers, a starving phenomenon is generated and, as a result, the channel with the strongest power receives all the amplification rates. To prevent this phenomenon, the gain profile of the EDFA should be flattened within a range of 0.5 to 1 dB.

Accordingly, Yang estimates the gain profile for the entire input power in advance, stores the estimated gain profile in a memory, measures the entire input power actually inputted, controls each of the amplification units of the EDFA by using the measured entire input power, and obtains a flattened gain profile.

However, Yang does not monitor the optical performance of the WDM optical transmission system at each channel. Therefore, with Yang it is impossible to measure *the actual input power of each channel* and the optical signal-to-noise ratio (OSNR). In other words, Yang measures only the total input power of the EDFA and calculates the power of each channel based on an assumption that the same power is being input to each channel. As a result, this method has a shortcoming in that it can be applied to a WDM transmission system of the point-to-point type only and cannot be applied to a WDM transmission system of multipoint-to-multipoint type where optical cross connects or optical add-drop multiplexers (OADM) are applied. Nor can Yang measure the wavelengths of each individual channel.

In short, the object of Yang is to flatten the gain tilt of the EDFA; Yang cannot measure the characteristics of each channel if the channel characteristics of multi-channel optical signals, such as power, wavelength and OSNR, are changed. Thus, the method of Yang flattens the gain profile of the EDFA by measuring amplified spontaneous emission (ASE) noise and channel power *based on the assumption that the channel characteristics are the same for all channels.*

In direct contrast to the teaching of Yang, which assumes that channel characteristics are the same for all channels, according to the present invention it is assumed that the channel-based characteristics of multi-channel optical signals *are different.* Thus, the present invention provides an apparatus that *measures the actual optical performance of each channel* to secure the

transmission performance of WDM optical transmission systems, including those systems (such as those using OADM) in which the *optical characteristics of each channel are not the same.* This is not taught or suggested by Yang.

Alexander discloses an optical monitoring system that can reduce the number of wavelength selecting devices, as compared to methods for measuring OSNR of each channel using a conventional wavelength selecting device. However, Alexander is disadvantageous in that it requires one or more extra wavelength selecting devices to measure the ASE noise sample. In addition, the WDM optical transmission system using the entire flattened gain band of an optical amplifier can hardly acquire ASE noise samples from the flattened gain band. Thus, the ASE noise sample should be measured outside the flattened gain band of the optical amplifier, which causes errors in calculating the OSNR of each channel.

The present invention, on the other hand, does not require any extra wavelength selecting devices in measuring the OSNR of each channel. In addition, since the entire ASE noise of the optical amplifier can be measured, the present invention can monitor the optical performance of the WDM optical transmission system in each channel as well as the performance of the optical amplifier.

Referring to Figure 3 of the present invention, the first optical distributing means divides a WDM optical signal into a plurality of optical signals each having a different wavelength. However, with reference to Figure 2 of Yang, there is no description therein of a distributing means nor of how it would be implemented.

Further, each of the first optical detecting means 330 of the present invention detects the power of the predetermined wavelength optical signal for one of the channels. In Yang, by contrast, the photo detector 30, 70, 110 senses the amplitude of the overall input signal. Hence, Yang fails to teach an apparatus for monitoring performance of each wavelength optical optical, and there is nothing to suggest how the structure of Alexander would be implemented therewith.

For at least the foregoing reasons, claim 1 is patentable over Yang whether taken alone or in combination with Alexander. Claims 2-5 are also in condition for allowance as claims properly dependent on an allowable base claim and for the subject matter contained therein. With respect to the rejection of claims 3-5 on the basis of Yang, Alexander and Chan, as just set forth, Yang and Alexander do not teach the invention which is set forth in claim 1, and the addition of Chan thereto, the latter being cited only as disclosing optical fiber gratings used in monitoring a WDM signal, does not provide the teaching which is missing from Yang and Alexander.

With this Amendment, the application is in condition for allowance. Should the Examiner have any questions or comments, the Examiner is cordially invited to telephone the undersigned attorney so that the present application can receive an early Notice of Allowance.

Respectfully submitted,

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